

The NVAP Global Water Vapor Climate Data Record: Plans for Improvement and Extension from 1987-2010

John Forsythe

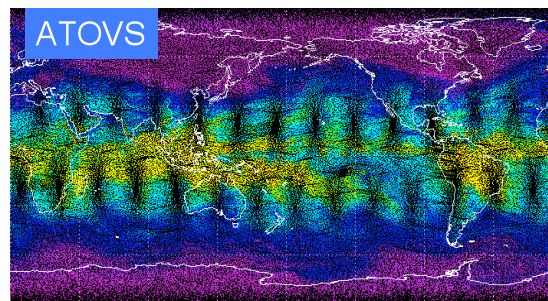
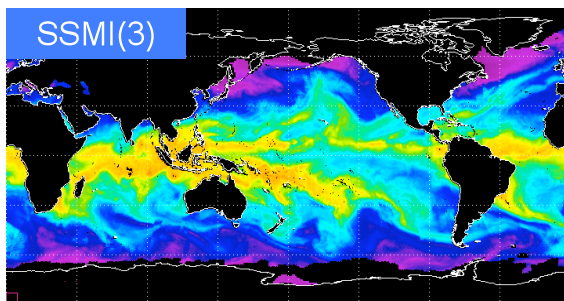
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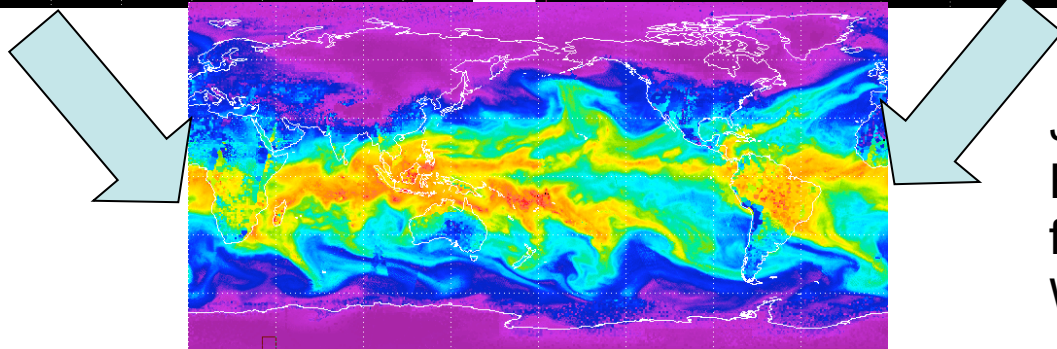
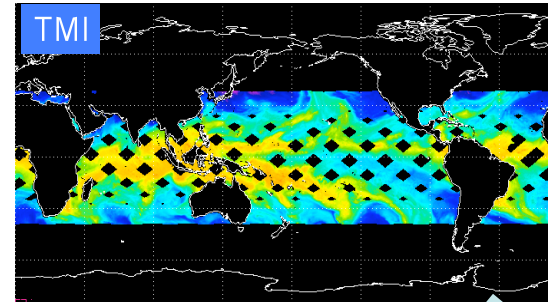
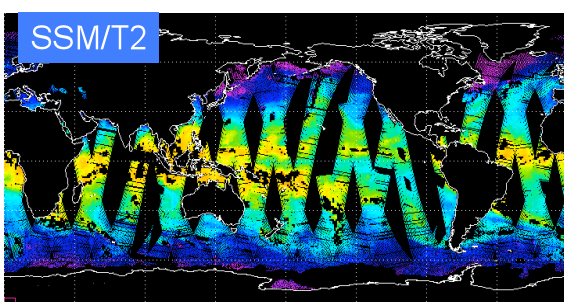
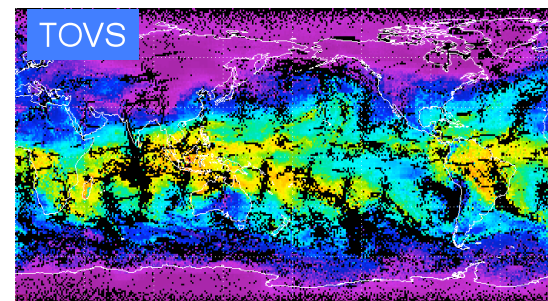
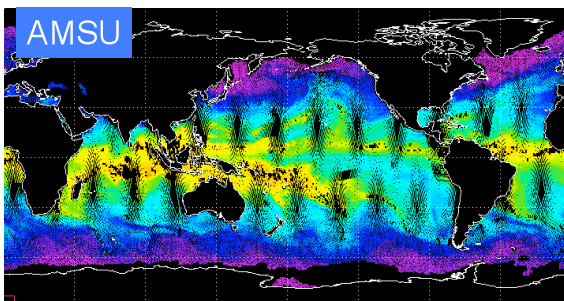


STC - METSAT

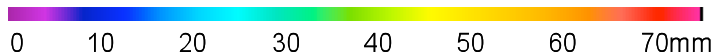
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NVAP =
NASA Water
Vapor
Project Data
Set.



Jan. 1, 2000.
Example of inputs
for Total Precipitable
Water.



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SYNOPSIS OF NVAP (1988 – 1999)

- Global 1 degree grid
- Daily
- Total Precipitable Water
- Cloud Liquid Water
- 4 layers of water vapor
- Inputs SSM/I, TOVS, rawinsondes

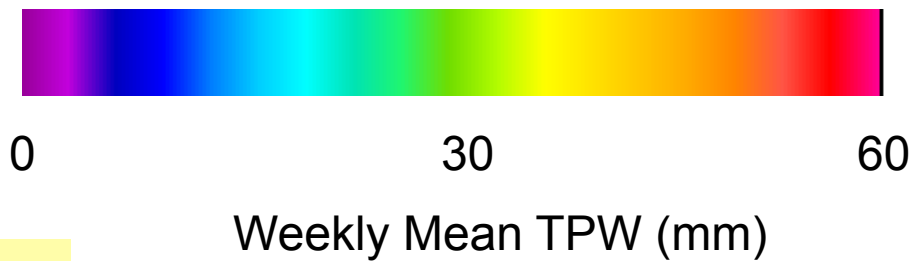
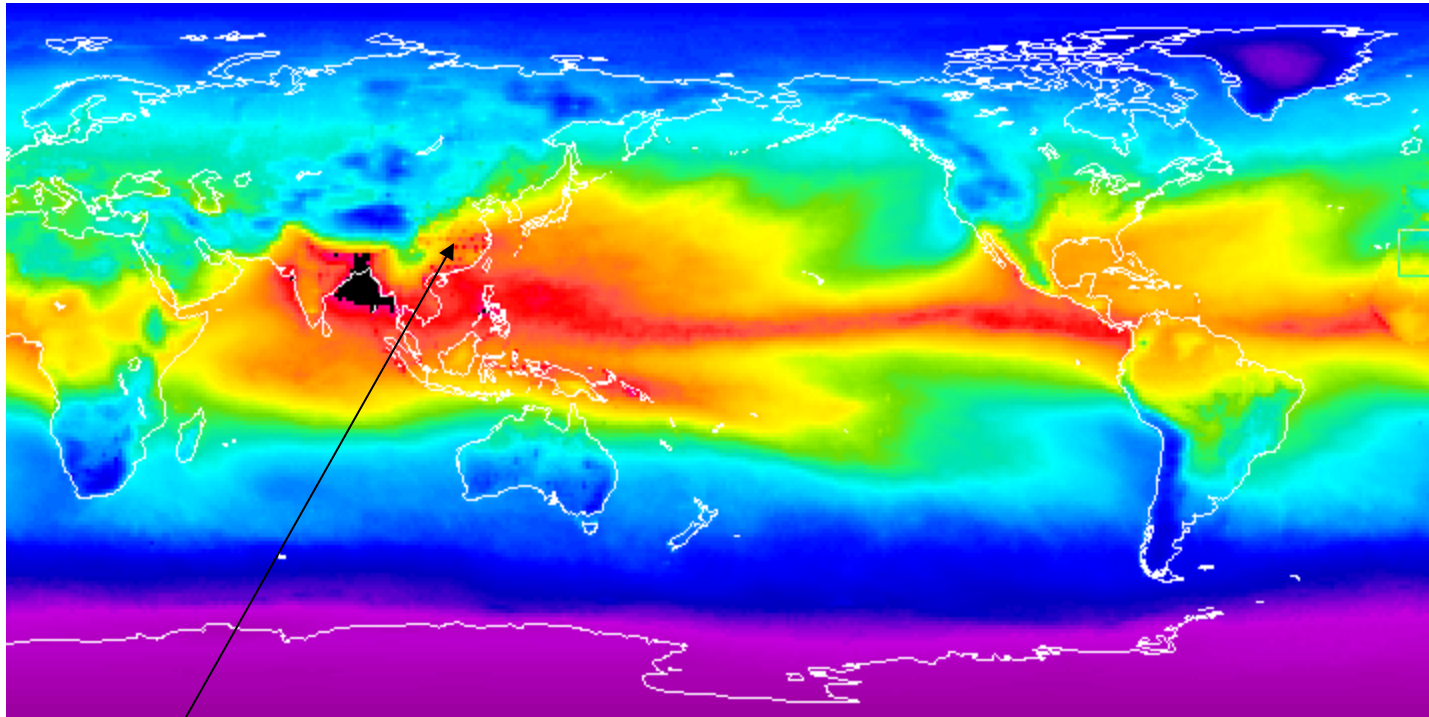
NVAP-Next Generation (2000 and 2001)

- Global 1/2 degree grid
- Twice Daily, and Daily
- Total Precipitable Water
- Cloud liquid water
- 5 layers of water vapor
- Data source and retrieval performance flags
- Inputs from three SSM/I, NOAA Operational ATOVS, AMSU and SSM/T-2, TMI, TOVS Pathfinder Path A.

NVAP is a multi-purpose dataset with daily global fields of moisture. It was created in four stages of NASA Pathfinder funding. It has never been reanalyzed... But a new effort under the NASA MEaSURES program will allow for a reanalysis.



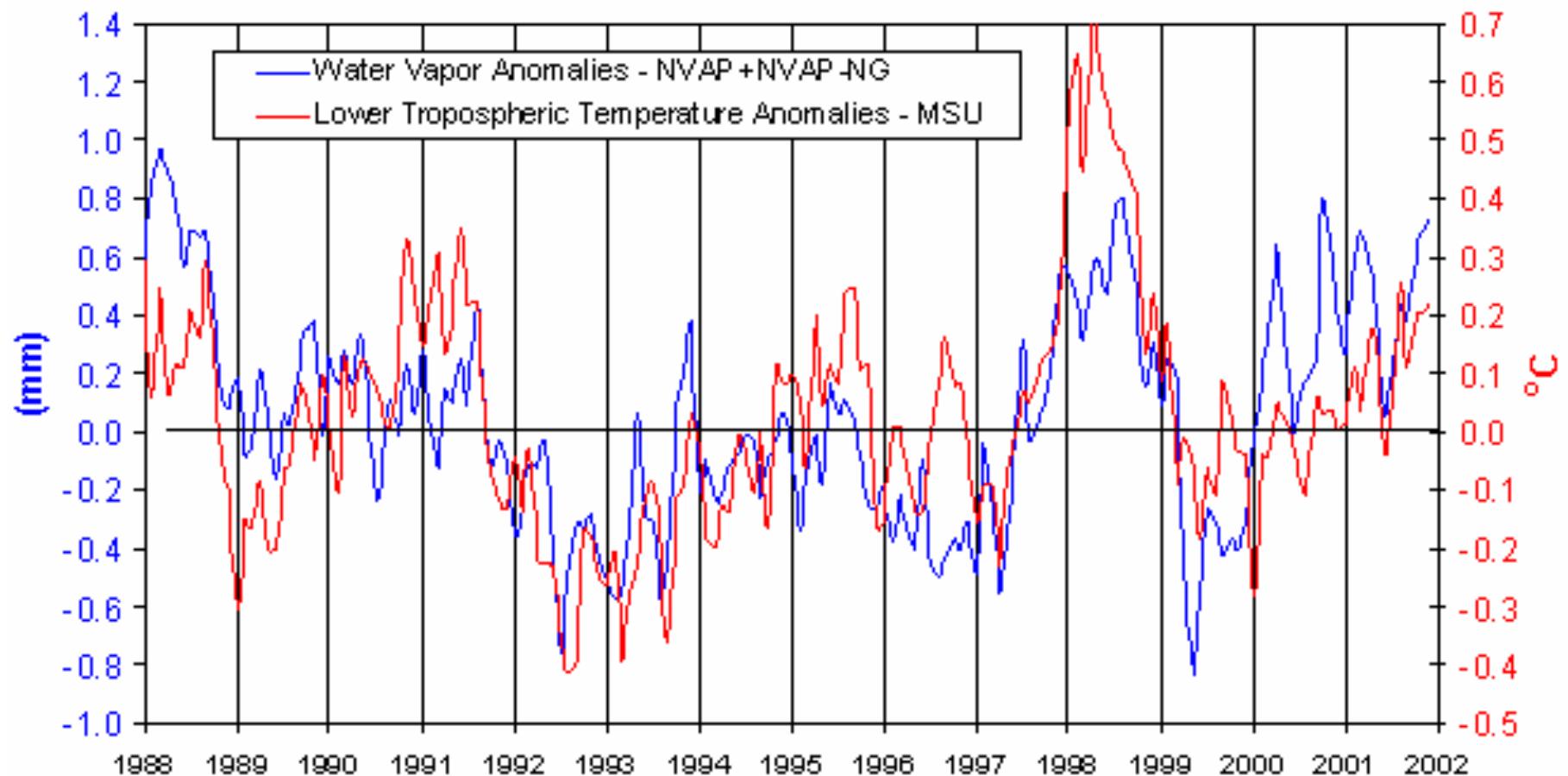
NVAP Weekly Mean TPW, August 20 – 26, 1988 – 1999.



Can be used by
forecasters for
flood forecasting
for instance...

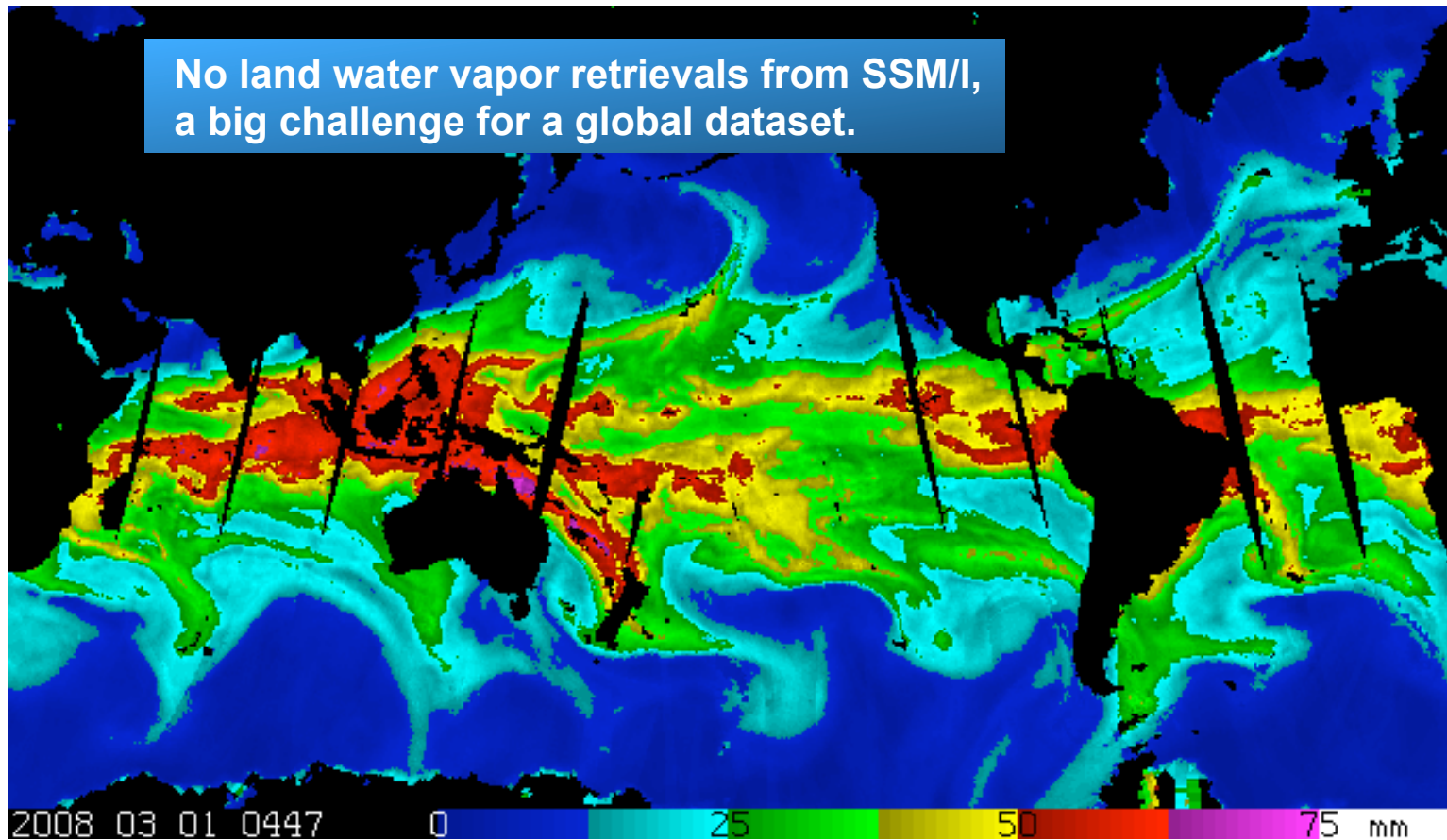
**Notice artifacts of
radiosondes**





Anomaly fields of NVAP Global TPW and MSU Temperature of Lower Troposphere

6 satellite (up to 3 AMSU + 3 SSM/I 6-hourly global ocean TPW for forecasters)



Kidder, S.Q., A. Jones, 2007: A blended satellite total precipitable water product for operational forecasting. *J. Atmos. Oceanic Technol.* **24**, 74-81.

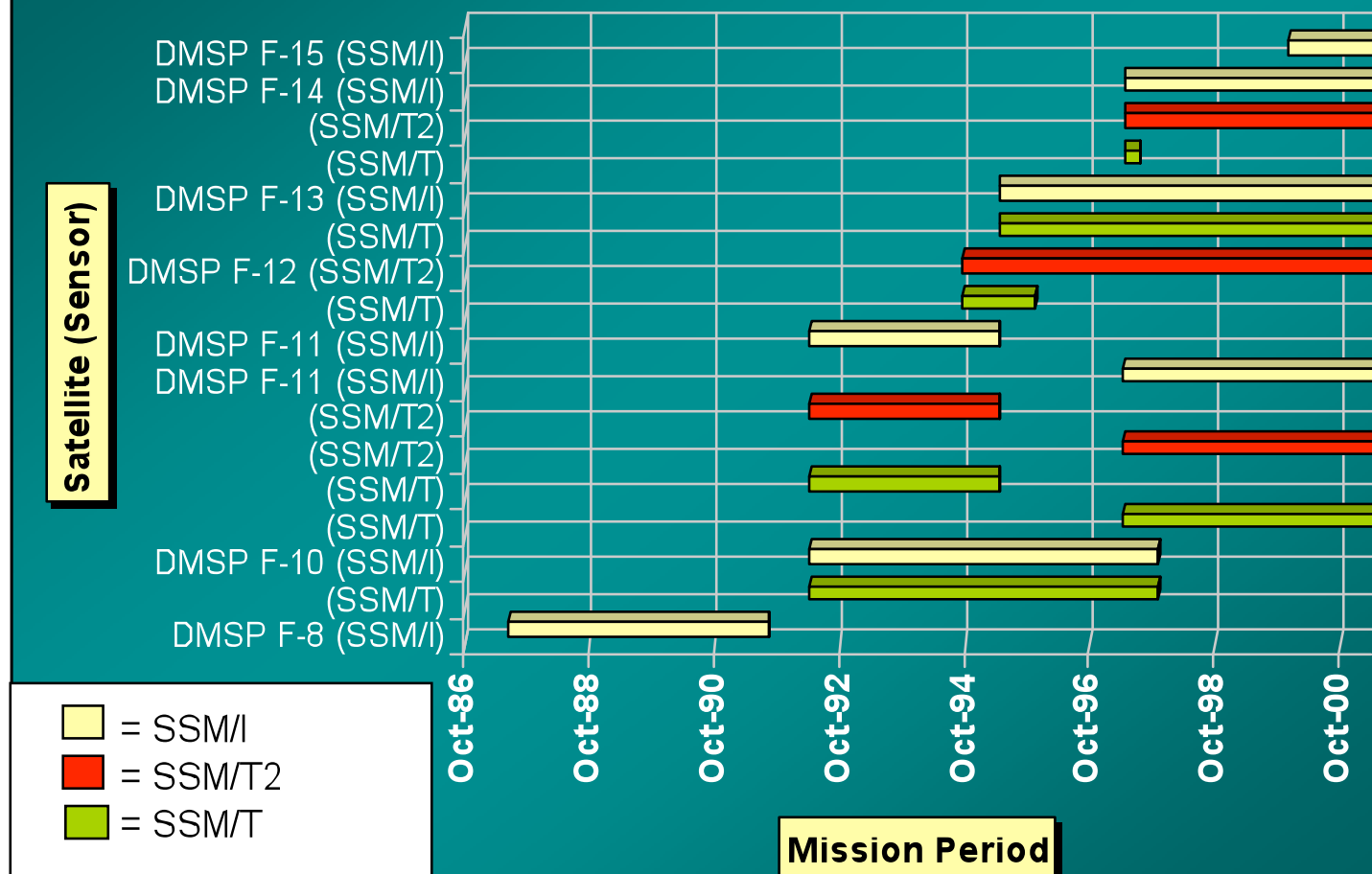
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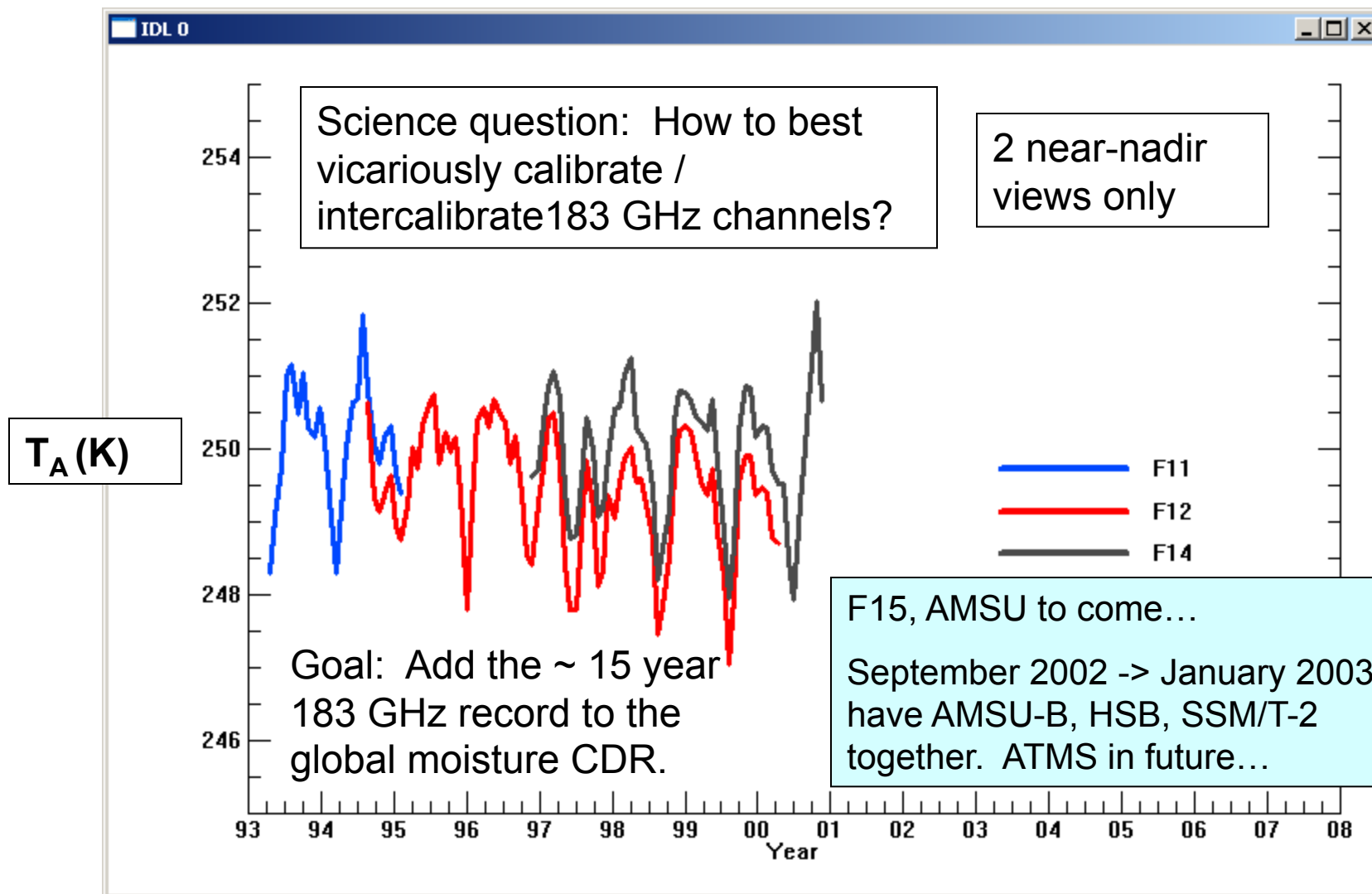


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DMSP Passive Microwave Sensors Through 2000



Monthly mean SSM/T-2 183 +/-1 GHz Tropical T_A (10N – 10 S)



Goal: Improve upon existing NVAP dataset to make a consistent global water vapor dataset for a variety of users.

Three types of users require different approaches:

- 1. Regional climate and process studies.** (“NVAP-R”). (e.g. North American Monsoon). Weather analysis. Requires consistency of days. Maximize spatial coverage, resolution.
- 2. Interannual variability.** (“NVAP-I”). Requires consistency of years.
- 3. Trends on multidecadal scales.** (“NVAP-T”). Requires consistency of decades.

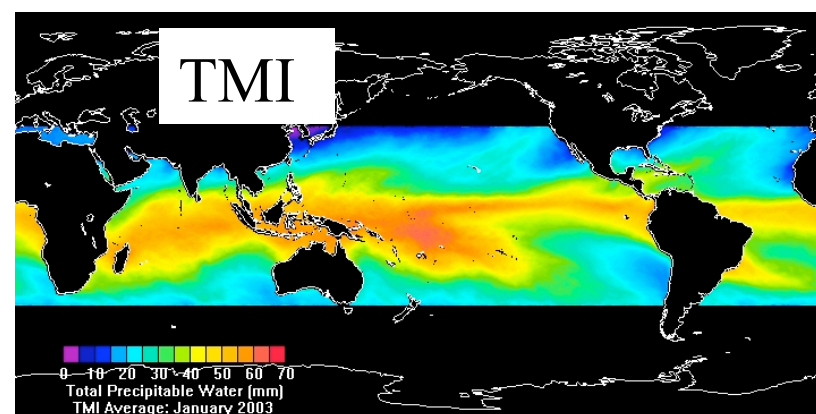
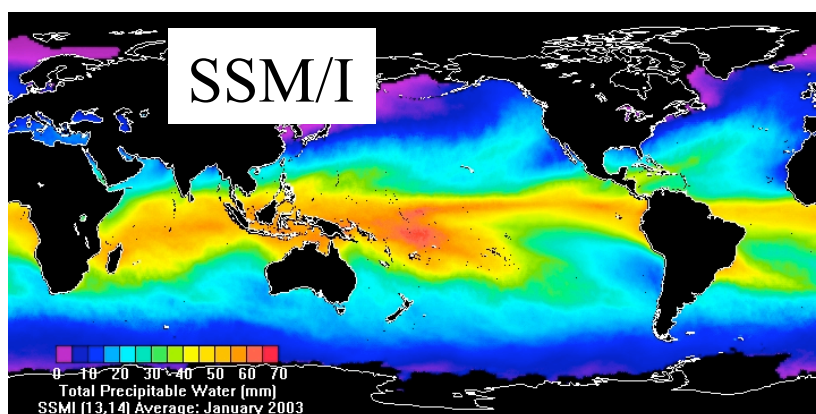
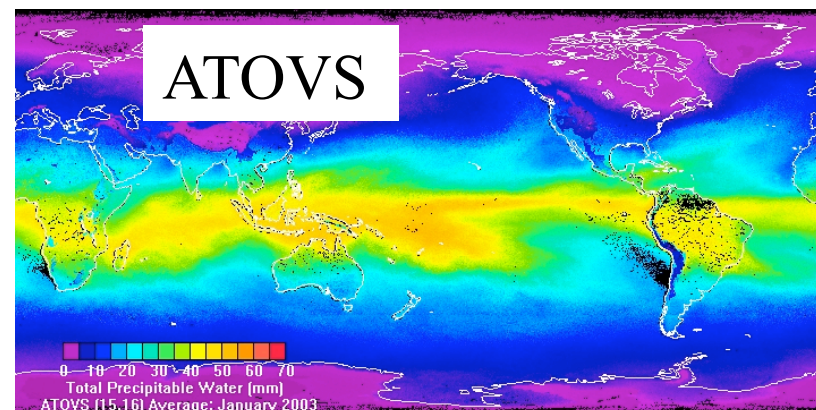
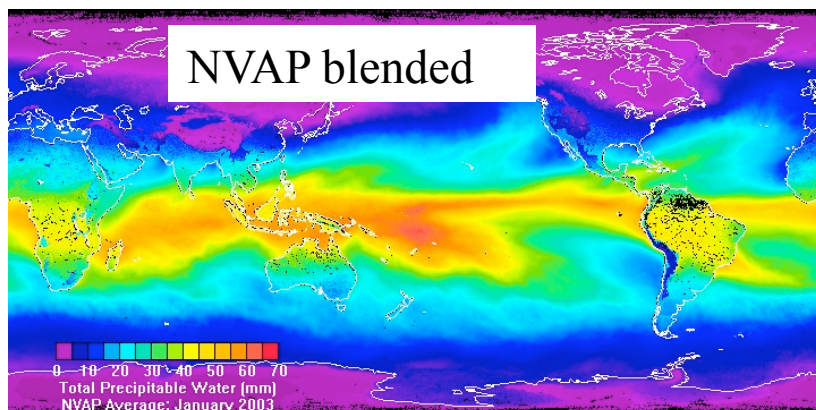
These uses place different demands on the water vapor products (maximizing spatial and temporal coverage, minimizing intersensor differences...)

Historically, NVAP has used a “one size fits all” approach. Current thinking with NVAP-MEaSURES is to create 3 related datasets tailored towards each user group.

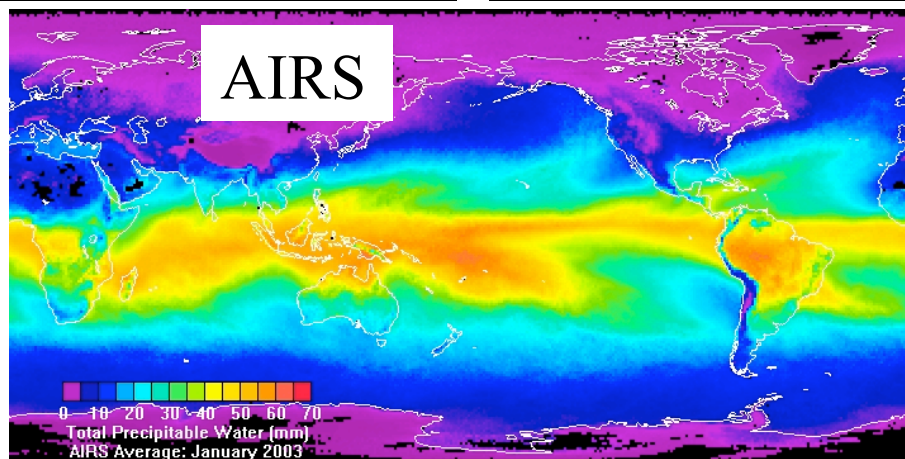
Major NVAP Time-Dependent Biases (1988 – 2001)	
Time Dependent Bias	Solution
TOVS: 1. Changes in NOAA operational TOVS algorithm through time.	Use a consistent climate-oriented retrieval such as NASA Pathfinder Path A (Susskind et al. 1997). Any thoughts on other TOVS moisture products? AIRS Intercomparison
SSM/I: 1. 22 GHz channel not used 1988-1992 2. Precipitation and sea ice detection methods vary 3. Need intercalibrated time series of TB's using new instrument knowledge.	Apply a fixed algorithm through time Chris Kummerow (CSU) working on SSM/I Tb time series
Radiosonde: 1. Varying quality control methods 2. 2000 – 2001 did not use radiosonde	Use climate-oriented data such as CARDS (Eskridge et al. 1999)
Miscellaneous: 1. Topography masking causes TPW too high over high terrain (1988 – 1992) 2. Land mask changed through time.	Use single high resolution (< 10 km) global topography mask such as GTOPO30



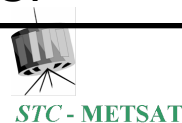
Total Precipitable Water



January 2003
comparison to
AIRS of SSM/I,
TMI and NOAA
operational
ATOVS.



More in-depth
comparisons to
AIRS
forthcoming
with the JPL
group of Fetzer
et al.



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Summary

- A reanalysis and extension of the NASA NVAP global water vapor dataset from 1987-2010 has begun under the NASA MEaSUREs program.
- Collaboration in progress with JPL AIRS group to study scene-dependent AIRS biases, compare other NVAP inputs to AIRS, and incorporate AIRS products into NVAP.
- We are currently researching CDR-quality total column and water vapor profile data sets from 1987 – present.
- Plan increased role of 183 GHz data for atmospheric moisture.
- Pre-Aqua satellite moisture products remain a challenge.